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**Question Paper Code : 52862**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fourth/Fifth/Sixth Semester

Computer Science and Engineering

CS 6401 – OPERATING SYSTEMS

(Common to Electronics and Communication Engineering/Electronics and Instrumentation Engineering/Instrumentation and Control Engineering/Medical Electronics/Information Technology)

(Regulation 2013)

(Also common to PTCS 6401 – Operating Systems for B.E. (Part-Time) for Third Semester – Computer Science and Engineering – Regulations 2014)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define operating system. Name the objectives of operating systems.

2. Elucidate system boot.

3. When a process creates a new process using the fork ( ) operation, which of the following state is shared between the parent process and the child process?
   (a) Stack
   (b) Heap
   (c) Shared memory segments.

4. What resources are used when a thread is created? How do they differ from those used when a process is created?

5. Under what circumstances do page faults occur? Describe the actions taken by the operating system when a page fault occurs.

6. Consider a logical address space of eight pages of 1024 words each, mapped onto a physical memory of 32 frames.
   (a) How many bits are there in the logical address?
   (b) How many bits are there in the physical address?

7. Why do some systems keep track of the type of a file, while others leave it to the user or simply do not implement multiple file types? Which system is "better?"

8. Why is it advantageous for the user for an operating system to dynamically allocate its internal tables? What are the penalties to the operating system for doing so?

9. The Linux kernel does not allow paging out of kernel memory. What effect does this restriction have on the kernel's design?

10. List down the benefits of virtualization.

PART B — (5 × 13 = 65 marks)

11. (a) (i) List five services provided by an operating system. Explain how each provides convenience to the users. (8)

(ii) Explain also in which cases it would be impossible for user-level programs to provide these services. (5)

Or

(b) Describe evolution of operating system. (13)

12. (a) (i) Write the difference between user thread and kernel thread. (8)

(ii) Palm OS provides no means of concurrent processing. Discuss three major complications that concurrent processing adds to an operating system. (5)

Or

(b) (i) What is the average turnaround time for the following processes using

(1) FCFS

(2) SJF non-preemptive

(3) Preemptive SJF. (9)

| Process | Arrival Time | Burst Time |
|---|---|---|
| P1 | 0.0 | 8 |
| P2 | 0.4 | 4 |
| P3 | 1.0 | 1 |

(ii) With example elucidate livelock. (4)

13. (a) Draw the diagram of segmentation memory management scheme and explain its principle. (13)

Or

(b) When do page faults occur? Consider the reference string:

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.

How many page faults and page fault rate occur for the FIFO, LRU and Optimal replacement algorithms, assuming one, two, three, four page frames? (13)

14. (a) (i) In a variable partition scheme, the operating system has to keep track of allocated and free space. Suggest a means of achieving this. Describe the effects of new allocations and process terminations in your suggested scheme. (5)

(ii) Consider a file currently consisting of 100 blocks. Assume that the file control block (and the index block, in the case of indexed allocation) is already in memory. Calculate how many disk I/O operations are required for contiguous, linked, and indexed (single-level) allocation strategies, if, for one block, the following conditions hold. In the contiguous-allocation case, assume that there is no room to grow in the beginning, but there is room to grow in the end. Assume that the block information to be added is stored in memory.

(1) The block is added at the beginning.

(2) The block is added in the middle.

(3) The block is added at the end.

(4) The block is removed from the beginning.

(5) The block is removed from the middle.

(6) The block is removed from the end. (8)

Or

(b) Consider a disk queue with requests for I/O to blocks on cylinders

98, 183, 37, 122, 14, 124, 65, 67

If the disk head is start at 53, then find out the total head movement with respect to FCFS, SSTF, SCAN, C-SCAN and LOOK scheduling. (13)

15. (a) (i) Explain the Components of Linux System with neat sketch. (6)

(ii) Write the Various System Administrator Roles in LINUX OS. (7)

Or

(b) How to Install and Configuring Network Services in LINUX?

PART C — (1 × 15 = 15 marks)

16. (a) (i) Consider the following system snapshot using data structures in the Banker's algorithm, with resources A, B, C, and D, and process P0 to P4:

| | Max | Allocation | Need | Available |
|---|---|---|---|---|
| | ABCD | ABCD | ABCD | ABCD |
| P0 | 6012 | 4001 | ???? | 3211 |
| P1 | 1750 | 1100 | | |
| P2 | 2356 | 1254 | | |
| P3 | 1653 | 0633 | | |
| P4 | 1656 | 0212 | | |

Using Banker's algorithm, answer the following questions.

(1) What are the contents of the Need matrix? (2)

(2) Is the system in a safe state? Why? (3)

(3) If a request from process P4 arrives for additional resources of (1,2,0,0,), Can the Banker's algorithm grant the request immediately? Show the new system state and other criteria.(4)

(ii) Consider a demand-paged computer system where the degree of multiprogramming is currently fixed at four. The system was recently measured to determine utilization of CPU and the paging disk. The results are one of the following alternatives. For each case, what is happening? Can the degree of multiprogramming be increased to increase the CPU utilization? Is the paging helping?

(1) CPU utilization 13 percent; disk utilization 97 percent

(2) CPU utilization 87 percent; disk utilization 3 percent

(3) CPU utilization 13 percent; disk utilization 3 percent. (6)

Or

(b) Explain in detail about

(i) File allocation methods. (6)

(ii) Process synchronization in OS. (9)

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